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TITLE OF THE INVENTION

ARTICLE OF FOOTWEAR, PARTICULARLY FOR CLIMBING

INVENTOR

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CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based upon French Patent Application No. 02.16241, filed December 12, 2002, the disclosure of which is hereby incorporated by reference thereto in its entirety and the priority of which is hereby claimed under 35 U.S.C. §119.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The invention relates to an article of footwear, particularly of the liner-type or ballerina type, provided more specifically for the field of climbing, such as rock climbing, the climbing of mountains, cliffs, ice, and artificial structures.

2. Description of Background and Relevant Information

[0003] The liner is a fundamental element of a climber's equipment. Indeed, the liner/lining is what is interposed between the climber's foot and the surface being climbed, and which must transmit all of the sensations/feelings and forces as precisely as possible to the climber.

[0004] Originally, climbing shoes were in fact mountain boots with a rigid sole that allowed climbing only from a support and consequently required the use of numerous climbing accessories, such as pitons, pegs, spikes, etc., to provide supports of a sufficient size.

[0005] Eventually, climbing techniques were developed that were based essentially on using the adherence between the climbing shoe and the wall, which practically eliminated the need for the aforementioned traditional climbing accessories since the supports can then have a much smaller size, or be non-existent.

[0006] New climbing shoes, generally called slippers, were then developed that were both much more flexible and lighter than the traditional mountain boots, and were provided with a smooth sole and coated with an elastomer or rubber material up to the upper in order to improve their gripping ability. Such slippers can provide a form-fitting upper compared to more traditional boots.

[0007] FIG. 1 shows from a rear perspective the overall construction of a climbing slipper of a known type, and FIG. 2 is a cross-sectional view, along the line II-II of FIG. 1, of such a slipper.

[0008] This slipper 1 of a known type is composed of a flexible upper 10 that can be either low, as shown in FIG. 1, or high or semi-high, for protecting the malleoli and the ankle when used in fissures.

[0009] The upper 10 is made of a synthetic material or of leather. It is provided at its upper end with a system 11 for retaining the foot, such as a lace. The foot retaining system 11 can be formed of simple elastic straps, particularly in the case of ballerinas that are lighter than slippers. The upper 10 is coated over its entire lower portion with a coating or strapping 12 made of an adhesive material, such as rubber or rubber-like material.

[0010] Lastly, the slipper has a sole 13 made of rubber, or the like, glued to the upper, and whose thickness is more or less substantial depending on the object(s) sought: rigidity/longevity or, on the contrary, flexibility/precision. The sole 13 is generally

smooth and made of a rubber-type material that is very adhesive for maximum efficiency. The front end 10a of the upper or tip is as thin as possible for maximum precision and, depending on the type of slipper, it can even be asymmetrical.

[0011] Generally, known slippers 1, or ballerinas, additionally have, in the area of the heel 10b, a strap 14 made of an elastic material, such as rubber, as shown in FIG. 1. The strap 14 is attached to the upper 10 and surrounds the heel of the slipper 1. It extends obliquely downward from the rear of the heel to the front thereof, and is generally mounted under tension.

[0012] In certain slippers/ballerinas 1, this strap 14 is even replaced by a partial or complete coating of the heel by an elastic material, such as rubber, also attached to the upper 10.

[0013] The object of this coating/strap 14 is to push the foot toward the front of the slipper 1 so as to guarantee retention and precision of the supports.

[0014] Optimally speaking, the elastic coating/strap must be present, but without an excessive force so as not to cause pain on the foot.

[0015] In practice, when purchasing a slipper/ballerina, even if the user is actually looking for a certain tension imparted by the coating/strap, it is very difficult to obtain the right tension. Indeed, a slipper of a given size will be too loose, whereas a smaller sized slipper or a slipper a half-size smaller will exert an excessive force and will practically be unbearable given the pain inflicted.

[0016] It even happens that the tension on the slipper, when the foot is inside it, is such that the material of the upper or the stitching thereof becomes torn.

SUMMARY OF THE INVENTION

[0017] An object of the present invention is to overcome the aforementioned drawbacks and to provide an article of footwear, particularly an article of footwear of the slipper or ballerina type, that allows for a good retention of the heel and a forward push of the foot without causing excessive pain for the foot.

[0018] In more general terms, an object of the invention is to provide an article of footwear that allows an efficient management and control of the tension desired in the area of the heel.

[0019] Another object of the invention is also to provide a structure for an article of footwear that permits a manufacturer to reduce the number of sizes.

[0020] The objects of the invention are achieved in providing an article of footwear according to the invention, which is of the type having a substantially non-extensible upper, a sole and a strap or an elastic element surrounding the heel, with the upper being at least partially extensible in the area of the heel.

[0021] Indeed, the fact of making the upper at least partially extensible allows eliminating the painful "string", or "threading", effect felt due to the almost non-extensibility of the upper.

[0022] The inventor of the invention disclosed and claimed herein has realized that, to his surprise and contrary to generally accepted wisdom, the range of action of the elastic strap of known slippers is very small due to the presence of the upper, or the nature of the particular upper, on which it is fixed.

[0023] As a matter of fact, because the upper is made of an almost non-extensible leather or textile material, the strap will have a marked elastic effect only in a small elongation range in which the material constituting the upper is not under tension. Once the tension range of the upper material is reached, the upper exerts a strong tension force that is much too substantial, generating excessive pain for the foot. The fact that the elastic range of the upper is very small and in fact does not cover the difference between two sizes also explains the difficulty for a user in selecting an article of footwear adapted to his or her particular foot.

BRIEF DESCRIPTION OF DRAWINGS

[0024] The invention will be better understood and other characteristics thereof will be shown by means of the following description, with reference to the attached schematic drawings, in which:

FIG. 1 is a rear perspective view of a slipper-type climbing shoe according to the prior art;

FIG. 2 is a cross-sectional view along the line II-II of FIG. 1;

FIG. 3 FIG. 3 is a view, similar to FIG. 1, of a climbing shoe according to the invention;

FIG. 4 is a cross-sectional view along the line IV-IV of FIG. 3;

FIG. 5 is a perspective bottom view, with a partial tear of the liner, of FIGS. 3 and 4;

FIG. 6 is a view, similar to FIG. 3, of a climbing shoe according to a second embodiment;

FIG. 7 is a diagram showing the differences in behavior of a slipper according to the invention and according to the prior art;

FIG. 8 is a view, similar to FIG. 3, of a preferred embodiment;

FIG. 9 is a detailed view of FIG. 8 with a portion partially broken away.

DETAILED DESCRIPTION OF THE INVENTION

[0025] FIGS. 3, 4, and 5 show the application of the invention to an article of footwear, a climbing shoe in particular, and, more particularly, a slipper or ballerina type climbing shoe, according to a first embodiment.

[0026] The invention can also be applied to other articles of footwear, for instance, dancing shoes, for which similar or equivalent problems need to be resolved. For convenience, although not as intended to be limiting, the term "slipper" will be used hereafter.

[0027] Like the climbing slipper according to the prior art shown in FIGS. 1 and 2, the slipper 101 according to the invention includes a flexible upper 110 having a heel portion 110b and a front portion 110a, as well as a system 111 for retaining the foot, a sole 113 made of an adhesive material, such as rubber, and a strapping 112 made of an adhesive material, such as rubber.

[0028] In addition, the upper 110 has, in its heel portion 110b, a strap 114 made of an elastic material, such as rubber, which extends obliquely downward from the rear of the heel to the front thereof.

[0029] A significant difference between the slipper according to the prior art and the slipper according to the invention lies in the fact that the upper 110 has a front portion 110a made of a practically non-extensible material, such as natural leather, synthetic leather, or synthetic fabric, whereas its rear portion 110b is, on the contrary, made of an elastically extensible material 115, such as neoprene, LYCRA®, or a CORDURA® brand elastic material.

[0030] Preferably, the rigidity of this type of material of the rear portion is such that the force to be applied, according to the ASTM D5035 standard, is less than 2 N/cm in width for an elongation of 30% or about 30%.

[0031] The two portions 110a, 110b of the upper 110 are connected by a line of stitching 116 or the like.

[0032] FIG. 7 clearly shows in a diagram the enormous advantage brought by the construction of the invention as compared to the slippers of the prior art.

[0033] This diagram shows, along the abscissa, the elongation L of the upper and, along the coordinate, the force F exerted by the elastic element (strap, shell) enveloping the heel, the elastic element being in both cases mounted under tension. ΔF represents the efficiency zone of the elastic element 114.

[0034] The curve A represents the elongation L of the upper as a function of the variation of the force F exerted in the area of the heel for a slipper of the prior art, having a predetermined elastic strap 114.

[0035] The curve B represents the same elongation L as a function of the force F for a slipper according to the invention, having a same elastic strap 114 in the area of the heel.

[0036] By studying the diagram, one can see that at the beginning, in a zone corresponding to a force going from 0 to F1, the curves A and B are similar. This zone corresponds to the "elastic" zone of the heel. In this zone, the strap 114, mounted under tension, is stretched until the upper material is in turn under tension.

[0037] Beyond this zone, the curve A "rises" suddenly and the elongation L, depending upon the force F exerted, becomes very low. This means that the rigidity of the slipper upper predominates in relation to the rigidity of the elastic element 114.

[0038] Consequently, the margin ΔL1 of length variation and therefore of adaptation to foot size as a function of the zone ΔF of heel efficiency becomes very small, and the pain threshold is quickly reached for a low variation ΔL in size.

[0039] The efficiency zone ΔF for the heel or strap 114 is defined by the range of forces comprised between a value F2, called an efficiency threshold and corresponding to the desired tension force, and a value F3 corresponding to the limit of bearable tension force, or pain threshold.

[0040] Therefore, the difficulty that exists for the constructions of current slippers for reconciling the problems of foot length and acceptable force of tension in the area of the heel is easily understood, because the margin ΔL1 of length variation is very small.

[0041] On the contrary, the curve B shows that, with the construction according to the invention, the elongation L increases consistently with the increase of the force F exerted by the heel and that, in practice, the efficiency zone ΔF corresponds to a range ΔL2 of length variation that is at least 50% higher (multiplied by 1.5).

[0042] The construction according to the invention therefore has numerous advantages, among which are:

- A better distribution of the forces in the area of the heel and of the Achilles tendon (because it is no longer the upper that imposes its rigidity) and therefore less risk of pain to the wearer.
- A better control of the overall tension of the slipper, an essential parameter of performance. Indeed, the tension is now completely defined by the elastic element 114

enveloping the heel, because there is no longer interference of the more rigid upper, and the tension can be determined in advance by a judicious selection of elastic modulus of the materials used in the rear portion of the heel (material of the upper in the heel zone, strap or rubber shell, or the like).

- A shoe fitting that is easier given the greater elasticity of the rear portion of the slipper.
- A higher tolerance over the length of the portion fitted. Because the elastic modulus of the upper/elastic element assembly 114 of the heel is less substantial, the range of the "fitting" length $\Delta L2$, allowing one to obtain the desired efficiency range ΔF of the slipper in terms of heel thrust, is greater.
- A greater comfort after the shoe fitting, because the "string" effect related to the non-extensible upper edge of the upper is eliminated.
- It becomes possible to classify the slippers by degree of tension and not by size. As an example, a heel efficiency range can be obtained for foot lengths corresponding to European sizes 39 to 41 (U.S. women's sizes about 8-10 and men's sizes about 6-8), so that a single slipper can be provided to cover these sizes.
- It becomes possible to have a modular design for the slipper because it is only the change of the strap 114 that changes the tension of the slipper.

[0043] As shown in FIG. 5, the elastic material 115 of the rear portion 110b of the upper can continue up to the area of the sole, i.e., below the foot, for a maximum foot feeling/sensation. It can also stop in the area of the upper insole.

[0044] FIG. 6 shows a second embodiment in which the elastic strap 114 is replaced by an elastic shell 124 that completely, or substantially completely, surrounds the heel. Other than this difference, the slipper has the same construction as the slipper of FIGS. 3 and 4, and its different elements are therefore designated by the same reference numerals.

[0045] As an alternative, the rear portion 115 of the upper can be eliminated and be replaced by a simple moisture absorbing material, such as a synthetic fabric (such as a CAMBRELLE® brand fabric), or a natural absorbent (such as cotton or leather), and which is fixed as a lining directly to the shell 124.

[0046] In fact, in this case, the upper 110 stops in the area of the junction line 116.

[0047] In any case, one can also provide for covering the inside of the upper (and/or the shell if it is not lined by the upper) with an adhesive material, such as PU, PVC, silicone, etc., and which can be applied as a coating, as strip applications, as picot stitching, etc.

[0048] FIGS. 8 and 9 show a third preferred embodiment in which the same elements are designated by the previously used reference numerals, increased by 100.

[0049] In this case, the slipper 201 also has a flexible upper 210 with a heel portion 210b and a front portion 210a, both made of a substantially non-extensible material, such as natural leather, synthetic leather, or a non-extensible synthetic fabric. Only a portion 215 of this heel portion 210b is extensible.

[0050] The upper 210 is therefore partially extensible in this heel portion 210b.

[0051] As mentioned previously, the extensible portion 215 is an elastic material, such as neoprene, LYCRA®, or a CORDURA® brand elastic material.

[0052] In the example shown, the elastic portion 215 of the heel has a substantially semi-circular form and is fixed in an associated cut out of the non-extensible upper 210, extending up to the upper edge 210c of the upper.

[0053] The elastic portion 215 can have a different form, such as, for example, a triangular form. It is essential in this embodiment that this elastic portion 215 itself is positioned at an upper edge 210c of the upper 210 so as to avoid the "string" effect and to provide the comfort necessary, and that it has dimensions, in the vertical and longitudinal directions, which are sufficient for providing the desired elongation ΔL2.

[0054] In practice, the minimal dimension values of the elastic portion 215 in the embodiment of FIGS. 8 and 9 are the following:

- A height "h" of at least 20%, or at least about 20%, of the height of the upper 210 along at least one substantially vertical line.
- A length "ℓ" of at least 10 millimeters along at least one line in the longitudinal direction.

[0055] The present invention is not limited to the particular embodiments described hereinabove by way of non-limiting examples, but encompasses all similar or equivalent embodiments.